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EXAMINER	
TRAN, THUAN Q	
ART UNIT	PAPER NUMBER
3693	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/014,919	BAKER ET AL.	
	Examiner	Art Unit	
	Thuan Tran	3693	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *6-18-2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *11-30 and 34-51* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *11-30 and 34-51* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Status of Claims

1. This action is in reply to the amendment filed on 6-18-2009.

2. Claims 11, 17, 34, 37, 43, and 50 are currently amended.

3. Claims 12-16, 18-30, 35, 36, 38-42, 44-49, and 51 are previously presented.

4. Claims 11-30 and 34-51 are currently pending and have been examined.

Priority

5. Applicant's claim for the benefit of a prior-filed application under 35 U.S.C. 119(e) or under 35 U.S.C. 120, 121, or 365(c) is acknowledged.

Response to Arguments

6. Applicant's arguments, filed 6-18-2009, with respect to the rejections under 35 USC 101 have been fully considered and are persuasive. The rejections under 35 USC 101 of claims 17-30 and 37-51 have been withdrawn.

7. Applicant's arguments, filed 6-18-2009, with respect to the rejection(s) of claim(s) 11-30 and 34-51 under 35 USC 103 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. **Claims 11-22, 28-30, 34-36** are rejected under 35 U.S.C. 103(a) as being unpatentable over Smith et al, Iterative Flattening (Smith), in view of Amico et al., Applying tabu search to the job-shop scheduling problem (Amico).

10. **As per claims 11, 17, and 34:**

Smith teaches:

- a load leveler (iterative flattening, see at least page 2 column 1) subsystem configured to receive data representative of the plurality of tasks for the project, and to generate a proposed schedule of start times for the plurality of tasks responsive to at least one scheduling constraint between at least two of the plurality of tasks (precedence constraints between pairs, see at least page 3 column 1) and fluctuations of resources utilized to perform the plurality of tasks (resource demand profiles over time, see at least page 3 column 1), wherein the plurality of tasks are steps in a workflow to complete the project (see at least page 2 column 1-2, The Scheduling Problem), and wherein the at least one

scheduling constraint requires a first task to be a predecessor to a second task within the workflow (precedence constraints between pairs, see at least page 3 column 1);

Although Smith teaches a load leveler to generate a schedule of start times for a job shop problem, he does not specifically teach that cost is estimated and minimized. However, Amico teaches:

- a cost estimator subsystem communicatively coupled to the load leveler subsystem to evaluate the proposed schedule of start times for the plurality of tasks to estimate a cost associated therewith (see at least page 232, the cost function); and
- a cost minimizer communicatively coupled to the cost estimator for modifying the proposed schedule of start times for the plurality of tasks responsive to the resource fluctuations and its associated cost (see at least page 232-233, tabu search used to find a minimum of the cost function for job shop problem);

Smith further teaches:

- wherein the load leveler subsystem is further configured to output data representative of the modified proposed schedule of start times for the plurality of tasks for the project (see at least page 6 column 1, future work considered in connection with random searches such as neighborhood analysis or taboo-list).

Examiner notes: In this context, taboo is a different spelling of the word tabu with the same meaning.

It would have been obvious to one of ordinary skill in the art at the time of the invention to produce solutions using iterative flattening of Smith to find a minimum cost using a cost minimizer such as a tabu search of Amico with motivation to find optimal solutions while maintaining a low threshold to the maximum computation time allowed, see at least Amico page 251 Final Remarks.

11. As per claims 12, 18, and 35,:

Smith in view of Amico teach a system to schedule the start times for a project. Smith does not specifically teach what type of programming model is used. Amico further teaches:

- wherein the cost estimator is implemented using a dynamic programming model (tabu search was first applied by Taillard, who proposed a parallel algorithm, see at least page 232);

It would have been obvious to one of ordinary skill in the art at the time of the invention to use a dynamic programming model with motivation to save time by taking advantage to problem's structure.

12. As per claims 13, 19, and 36:

Smith in view of Amico teach a system to schedule the start times for a project. Smith does not specifically teach what type of programming model is used. Amico further teaches:

- wherein the cost estimator is implemented using a linear programming model (tabu search was first applied by Taillard, who proposed a sequential algorithm, see at least page 232);

It would have been obvious to one of ordinary skill in the art at the time of the invention to use a dynamic programming model with motivation to implement the program in many diverse fields increasing the system's usefulness.

13. As per claim 14, Smith further teaches**:**

- where in the load leveler further comprises a makespan minimizer configured to determine a minimum length schedule of tasks (minimizing overall schedule makespan) that uses at most a maximum number of resources to complete the tasks (a feasible solution… does not violate resource capacity limits, see at least page 2 column 1);
- wherein at least one of the tasks is subject to at least one constraint on the location of the task in the schedule of start times for the plurality of tasks (precedence constraints between pairs, see at least page 3 column 1);

Examiner notes: For example, a precedence constraint between pairs that limits a task A to follow another task B results in a constraint on the location of the task A in the schedule of start times for the plurality of tasks. Task A must not appear at the beginning of the schedule of start times for the plurality of tasks since it must follow the another task B.

14. **As per claim 15,** Smith further teaches:

- further comprising using a schedule packing algorithm (iterative flattening algorithm, see at least page 5 column 1 and 2);

15. **As per claims 16,** Amico further teaches:

- wherein the cost minimizer subsystem comprises an incremental improvement engine (from an initial solution, the local search algorithm repeatedly replaces the current solution by a neighboring one until a superimposed stopping criterion becomes true) configured to determine for each of a plurality of tasks, each task having a plurality of possible start times, a start time for the task that results in a lowest estimated cost for the proposed schedule of start times for the plurality of tasks (see at least page 232, the goal of the tabu search is to find a solution of minimum cost).

16. **As per claim 20,** Smith further teaches:

- wherein generating the proposed schedule of start times includes associating a limitation with each of the resources and producing the proposed schedule of start times for the plurality of tasks responsive to each limitation (see at least page 2 column 1-2, The Scheduling Problem);

17. **As per claim 21,** Smith further teaches:

- wherein generating the proposed schedule of start times for the plurality of tasks includes iteratively reducing the limitation for one of the resources and load-leveling the resources (the iterative flattening algorithm, see at least page 5 column 1-2);

18. As per claim 22, Amico further teaches:

- wherein evaluating the proposed schedule of start times for the plurality of tasks includes determining costs associated with the resource fluctuations (see at least page 232, the cost function);

19. As per claim 28:

Smith further teaches:

- wherein generating the proposed schedule comprises identifying an admissible window in the proposed schedule for each task (formulating the problem as an STP provides beginning and end of temporal horizons, see at least Smith page 3 column 1 and footnote 2) and iteratively placing each task within the proposed schedule (iterative flattening, see at least Smith page 2 column 1) responsive to the admissible window (each activity has a constant processing time, see at least Smith page 2 column 1 under The Scheduling Problem), a priority of the task (precedence constraints between pairs, see at least Smith page 3 column 1),

Smith does not teach calculating a cost. Amico teaches

- a cost of at least part of the proposed schedule having the task placed therein (the cost function, see at least Amico page 232);

It would have been obvious to one of ordinary skill in the art at the time of the invention to produce solutions using iterative flattening of Smith to find a minimum cost using a cost minimizer such as a tabu search of Amico with motivation to find optimal solutions while maintaining a low threshold to the maximum computation time allowed, see at least Amico page 251 Final Remarks.

20. As per claim 29:

Smith further teaches wherein evaluating the proposed schedule comprises examining one of the tasks to estimate the load associated with the proposed schedule responsive to moving the task within a window describing allowable locations of the task in the schedule (local search based on ESTA, see at least Smith page 4 column 2 to page 5 column 2). He does not teach that the load is associated with a cost. Amico teaches a cost function associated with a schedule load. Together Smith in view of Amico teach:

- wherein evaluating the proposed schedule comprises examining one of the tasks to estimate the cost (the cost function, see at least Amico page 232) associated with the proposed schedule responsive to moving the task within a window describing allowable locations of the task in the schedule (local search based on ESTA, see at least Smith page 4 column 2 to page 5 column 2);

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the cost function of Amico when evaluating the proposed schedule with motivation to find optimal solutions while maintaining a low threshold to the maximum computation time allowed, see at least Amico page 251 Final Remarks.

21. **As per claim 30,** Smith further teaches**:**

- wherein the resource fluctuations are determined by using a profile for each of the resources (resource demand profile, see at least page 3 column 1).

22. **Claims 37-47, and 49-51** are rejected under 35 U.S.C. 103(a) as being unpatentable over Smith et al, Iterative Flattening (Smith), in view of Amico et al., Applying tabu search to the job-shop scheduling problem (Amico), in further view of Stidsen et al., Jobshop scheduling in a shipyard (Stidsen).

23. **As per claims 37, 43, and 50:**

Smith teaches:

- a load leveler (iterative flattening, see at least page 2 column 1) subsystem configured to receive data representative of the plurality of tasks for the project, and to generate a proposed schedule of start times for the plurality of tasks responsive to at least one scheduling constraint between at least two of the plurality of tasks (precedence constraints between pairs, see at least page 3

column 1) and fluctuations of resources utilized to perform the plurality of tasks (resource demand profiles over time, see at least page 3 column 1), wherein the plurality of tasks are steps in a workflow to complete the project (see at least page 2 column 1-2, The Scheduling Problem), and wherein the at least one scheduling constraint requires a first task to be a predecessor to a second task within the workflow (precedence constraints between pairs, see at least page 3 column 1);

Although Smith teaches a load leveler to generate a schedule of start times for a job shop problem, he does not specifically teach that cost is estimated and minimized. However, Amico teaches:

- a cost estimator subsystem communicatively coupled to the load leveler subsystem to evaluate the proposed schedule of start times for the plurality of tasks to estimate a cost associated therewith (see at least page 232, the cost function); and
- a cost minimizer communicatively coupled to the cost estimator for modifying the proposed schedule of start times for the plurality of tasks responsive to the resource fluctuations and its associated cost (see at least page 232-233, tabu search used to find a minimum of the cost function for job shop problem);

Smith further teaches:

- wherein the load leveler subsystem is further configured to output data representative of the modified proposed schedule of start times for the plurality of

tasks for the project (see at least page 6 column 1, future work considered in connection with random searches such as neighborhood analysis or taboo-list). Examiner notes: In this context, taboo is a different spelling of the word tabu with the same meaning.

It would have been obvious to one of ordinary skill in the art at the time of the invention to produce solutions using iterative flattening of Smith to find a minimum cost using a cost minimizer such as a tabu search of Amico with motivation to find optimal solutions while maintaining a low threshold to the maximum computation time allowed, see at least Amico page 251 Final Remarks.

Smith in view of Amico teach a scheduling system for generating a schedule of start times of tasks for a project to minimize cost. They do not specifically teach that the project is a ship. However Stidsen teaches:

- wherein the project is a ship (see at least the abstract).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the scheduling system of Smith in view of Amico in building a ship with motivation to save time and money by taking advantage of improved scheduling systems to plan large and complex projects that need high flexibility such as ship construction, see at least the abstract of Stidsen.

24. As per claims 38, 44 and 51, Stidsen further teaches:

- Wherein the tasks comprise welding, painting, electrical work, or any combination thereof (see at least page 2 column 2, welding robots perform welding);

25. **As per claim 39,** Smith further teaches:

- where in the load leveler further comprises a makespan minimizer configured to determine a minimum length schedule of tasks (minimizing overall schedule makespan) that uses at most a maximum number of resources to complete the tasks (a feasible solution… does not violate resource capacity limits, see at least page 2 column 1);
- wherein at least one of the tasks is subject to at least one constraint on the location of the task in the schedule of start times for the plurality of tasks (precedence constraints between pairs, see at least page 3 column 1);

Examiner notes: For example, a precedence constraint between pairs that limits a task A to follow another task B results in a constraint on the location of the task A in the schedule of start times for the plurality of tasks. Task A must not appear at the beginning of the schedule of start times for the plurality of tasks since it must follow the another task B.

26. **As per claim 40,** Smith further teaches:

- where in the load leveler further comprises a makespan minimizer configured to determine a minimum length schedule of tasks (minimizing overall schedule makespan) that uses at most a maximum number of resources to complete the tasks (a feasible solution… does not violate resource capacity limits, see at least page 2 column 1);

- wherein at least one of the tasks is subject to at least one constraint on the location of the task in the schedule of start times for the plurality of tasks (precedence constraints between pairs, see at least page 3 column 1);

Examiner notes: For example, a precedence constraint between pairs that limits a task A to follow another task B results in a constraint on the location of the task A in the schedule of start times for the plurality of tasks. Task A must not appear at the beginning of the schedule of start times for the plurality of tasks since it must follow the another task B.

27. As per claim 41, Smith further teaches**:**

- further comprising using a schedule packing algorithm (iterative flattening algorithm, see at least page 5 column 1 and 2);

28. As per claims 42, Amico further teaches**:**

- wherein the cost minimizer subsystem comprises an incremental improvement engine (from an initial solution, the local search algorithm repeatedly replaces the current solution by a neighboring one until a superimposed stopping criterion becomes true) configured to determine for each of a plurality of tasks, each task having a plurality of possible start times, a start time for the task that results in a lowest estimated cost for the proposed schedule of start times for the plurality of tasks (see at least page 232, the goal of the tabu search is to find a solution of minimum cost).

29. **As per claim 45,** Smith further teaches:

- wherein generating the proposed schedule of start times includes associating a limitation with each of the resources and producing the proposed schedule of start times for the plurality of tasks responsive to each limitation (see at least page 2 column 1-2, The Scheduling Problem);

30. **As per claim 46,** Smith further teaches:

- wherein generating the proposed schedule of start times for the plurality of tasks includes iteratively reducing the limitation for one of the resources and load-leveling the resources (the iterative flattening algorithm, see at least page 5 column 1-2);

31. **As per claim 47,** Amico further teaches:

- wherein evaluating the proposed schedule of start times for the plurality of tasks includes determining costs associated with the resource fluctuations (see at least page 232, the cost function);

32. **As per claim 49,** Smith in view of Amico in view of Stidsen further teaches:

Smith further teaches:

- wherein generating the proposed schedule comprises identifying an admissible window in the proposed schedule for each task (formulating the problem as an

STP provides beginning and end of temporal horizons, see at least Smith page 3 column 1 and footnote 2) and iteratively placing each task within the proposed schedule (iterative flattening, see at least Smith page 2 column 1) responsive to the admissible window (each activity has a constant processing time, see at least Smith page 2 column 1 under The Scheduling Problem), a priority of the task (precedence constraints between pairs, see at least Smith page 3 column 1),

Smith does not teach calculating a cost. Amico teaches

- a cost of at least part of the proposed schedule having the task placed therein (the cost function, see at least Amico page 232);

It would have been obvious to one of ordinary skill in the art at the time of the invention to produce solutions using iterative flattening of Smith to find a minimum cost using a cost minimizer such as a tabu search of Amico with motivation to find optimal solutions while maintaining a low threshold to the maximum computation time allowed, see at least Amico page 251 Final Remarks.

33. **Claims 23 and 27** are rejected under 35 U.S.C. 103(a) as being unpatentable over Smith et al, Iterative Flattening (Smith), in view of Amico et al., Applying tabu search to the job-shop scheduling problem (Amico), in further view of Caulfield, US 2002/0065702.

34. As per claim 23:

Smith in view of Amico in view of Stidsen teach claim 22. They do not teach the specific cost associated with the resource fluctuations. However, Caulfield teaches:

- wherein the costs associated with the resource fluctuations include at least one of the group of resource acquisitions costs, resource disposition costs, incremental costs for resource over-utilization, and incremental costs for resource under-utilization (idle time, see at least paragraph 0010);

It would have been obvious to one of ordinary skill in the art at the time of the invention to include these costs that are associated with resource fluctuation with motivation to better estimate job price by factoring in the full cost of human resources, see at least Caulfield paragraph 0004.

35. As per claim 27, Caulfield further teaches**:**

- wherein incremental costs for resource under-utilization include an idle resource cost (0053-0054);

36. **Claims 48** are rejected under 35 U.S.C. 103(a) as being unpatentable over Smith et al, Iterative Flattening (Smith), in view of Amico et al., Applying tabu search to the job-shop scheduling problem (Amico), in further view of Stidsen et al., Jobshop scheduling in a shipyard (Stidsen), in further view of Caulfield, US 2002/0065702.

37. As per claim 48:

Smith in view of Amico in view of Stidsen teach claim 47. They do not teach the specific cost associated with the resource fluctuations. However, Caulfield teaches:

- wherein the costs associated with the resource fluctuations include at least one of the group of resource acquisitions costs, resource disposition costs, incremental costs for resource over-utilization, and incremental costs for resource under-utilization (idle time, see at least paragraph 0010);

It would have been obvious to one of ordinary skill in the art at the time of the invention to include these costs that are associated with resource fluctuation with motivation to better estimate job price by factoring in the full cost of human resources, see at least Caulfield paragraph 0004.

38. **Claims 24-26** are rejected under 35 U.S.C. 103(a) as being unpatentable over Smith et al, Iterative Flattening (Smith), in view of Amico et al., Applying tabu search to the job-shop scheduling problem (Amico), in further view of Caulfield, US 2002/0065702 in further view of Borton, US 2001/0047274.

39. As per claims 24-27:

Smith in view of Amico in view of Stidsen in view of Caulfield teach claim 23. They do not give details of every cost that is associated with a resource fluctuation. However, Borton teaches:

- wherein resource acquisition costs include a hiring cost (hiring cost, see at least paragraph 0017);

- wherein resource disposition costs include a firing cost (job turnover, see at least paragraph 0017);
- wherein incremental costs for resource over-utilization include an overtime cost (overtime, see at least paragraph 0017);

It would have been obvious to one of ordinary skill in the art at the time of the invention to include these costs that are associated with resource fluctuation with motivation to better estimate job price by factoring in the full cost of human resources, see at least Caulfield paragraph 0004.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thuan Tran whose telephone number is 571-270-1832. The examiner can normally be reached on Monday-Friday 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, James Kramer can be reached on 571-272-6783. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Thuan Tran
Patent Examiner
10-16-2009

/Stefanos Karmis/
Primary Examiner, Art Unit 3693